

BOOK REVIEWS

Tilden's "The Algae and their Life Relations"¹

Professor Tilden, who is well known to students of the algae through her monograph of the "Myxophyceae of North America and Adjacent Parts" and other important works, has recently published her *magnum opus* under the above title. It is designed especially to give students an outline of the fundamentals of phycology, and the term "algae" is interpreted in its broadest sense, including the Blue-greens (Cyanophyceae) and Yellow-greens (Chrysophyceae), as well as the Greens, the Browns, and the Reds. A geological time-table, showing the supposed sequence of the larger groups of algae, with the Cyanophyceae the oldest (early Archaeozoic) and the Chlorophyceae the latest (Proterozoic), and showing also the sequence of the higher groups of plants, occupies the frontispiece. The author considers the development of the main lines to have been, for the most part, parallel rather than branching and tree-like.

A general work of this kind can hardly aim to be complete in its references to genera and species, but most of the larger and more important genera are briefly described and many of them are illustrated. While the author appears to be usually accurate and up to date in discussing the general morphology and cytology of the algae, the reader may be a bit surprised to find her writing of *Caulerpa* "method of reproduction unknown," when the presence of swarmers in *Caulerpa* was announced by Dostal as early as 1928. This was confirmed by Schussnig in 1929, by Ernst in 1931, and by Iyengar in 1933, the later observers noting two sizes of the supposed gametes.

The bibliography, though occupying 23 pages of small print and seemingly very full, shows several curious lacunae. Thus J. Agardh, whose books and papers on the algae include more than 40 titles and who is one of foremost writers in this field, is wholly missing in the list, and his distinguished father, C. Agardh, is represented only by the first part of the first volume of his classic "Species Algarum." Also, the names of Montagne, Schmitz, and Foslie, each with numerous important papers to his credit, are among the missing. Bornet & Thuret are repre-

¹ Tilden, Josephine E. The algae and their life relations. 8-vo. Pp. i-xii +1-550. f. 1-257 + pl. 1-9. 1935. The University of Minnesota Press, Minneapolis. Price \$5.00.

sented by their "Notes algologiques," but not by the classic folio "Études phycologiques." Gardner appears only through his coöperation with Setchell, Wille's numerous and important contributions are represented only by a four-page paper, and Mme. Weber-van Bosse's principal work, her 535-page, beautifully illustrated quarto, "Liste des algues du Siboga" is omitted, as is also Sirodot's monograph of "Les Batrachospermes," with its 299 quarto pages and 50 plates.

An expression that will mystify both amateur and professional mathematicians occurs in connection with magnified figures published on several of the later pages of Professor Tilden's book, as on page 498, where it is stated that the figures are " $\times 1000$. The true measurement was multiplied by 5 mm." Whether "the true measurement" was in millimeters, lines, or what-not, the orthodox arithmetician will find difficulty in multiplying it "by 5 mm."!

The chapters on "Algal Food of Animals" and "Marine Algae, Our Richest Source of Vitamins: Algae as Food for Man" will prove of special interest, both to the botanist and to the layman. Some of the paragraphs of these chapters are quoted below:

"Although it is not generally recognized as a fact, it is the algae of the ocean, consisting of both attached seaweeds and plankton forms, that constitute the basal link in the food chain of all our important food fish. These in turn are consumed by man, who forms the terminal link in the chain.

"That animals are not able to manufacture food is a matter of common, but generally neglected, knowledge. Plants are the only organisms able to perform that function. *Marine algae, then, must manufacture all of the food consumed by marine animals.* When one stops to consider the countless numbers of creatures—ranging from microscopic organisms to huge monsters—which swim in the sea, when one contemplates the sum total of energy expended by these animals and the amount of food required to supply this energy, it seems incredible that all the proteins, carbohydrates, fats, and vitamins had their origin in the microscopic cells of marine algae. This, however, is a fact, a fact that demands attention. It is time that the primary links of the food chain receive due recognition. The algae, and the animals which feed directly upon algae, should be studied with all possible care, both as a scientific problem and as a basis for practice."

"Since the marine algae are even richer in iodine and some of the other food factors than are marine animals, they especially should be in human diet. The writer had the good fortune to live for a time in Tahiti while the natives were still living on a diet consisting largely of fruits, vegetables, and sea foods, including marine algae, or *rimu*. The people were vigorous in body and mind, handsome and healthy, and they had perfect teeth. Another visit to the island was made after pastry shops and ice-cream wagons had been introduced into this paradise. The bad effects of the foreign diet were already apparent. Tahitian children today have soft, crumbling, and badly decayed teeth.

"From time immemorial marine algae have formed a very important part of the food of the Japanese people. At present perhaps six or seven different kinds of seaweeds are used at a single meal. Goiter is unknown in Japan. Without doubt the hitherto almost national diet in Japan, consisting of rice, fish, and seaweed, has had much to do with the good health, and the consequent high degree of general intelligence and unusual artistic, literary, and scientific attainments of this race. Among the people of China the same thing is true. In the 'extraordinary physical capacity and endurance of her people there is the physical basis of their success throughout the ages'."

"Already two or three firms in the United States and one in England are selling seaweed products made from the large kelps under special trade names. One marine plant consisting of the fronds of the large kelp *Macrocystis pyrifera* (L.) C. A. Agardh, processed in such a way that its valuable minerals are preserved, has been thoroughly investigated by chemists and its effects checked by physicians. This dried kelp is found to contain iodine, iron, copper, calcium, phosphorus, sodium, potassium, magnesium, sulphur, manganese, aluminum, zinc, and chlorine, with traces of other elements. It is also a good source of vitamins B and D and an excellent source of vitamins A and E. (The fresh seaweed of course possesses vitamin C.) No other known food contains such a wealth of minerals and vitamins."

The illustrations are generally excellent, the press work is good, and, withal, Professor Tilden's book seems destined to play an important part in popularizing the study of the algae.

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